TRANSLATION

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
M/44209-PCT		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2004/014241	14.12.2004	15.12.2003
International Patent Classification (IPC) or national classification and IPC		
C07C45/74		
Applicant		
BASF AKTIENGESELLSCHAFT		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 2 sheets, as follows:

      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))

      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/014241

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (Rule 12.3 and 23.1(b))

☐ publication of the international application (Rule 12.4)

☐ international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-14 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

nos. _____ as originally filed/furnished

nos.* _____ as amended (together with any statement) under Article 19

nos.* 1-12 received by this Authority on 17.10.2005 with telefax

nos.* _____ received by this Authority on _____

☐ the drawings:

sheets _____ as originally filed/furnished

sheets* _____ received by this Authority on _____

sheets* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/014241

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-12	YES
	Claims		NO
Inventive step (IS)	Claims	1-12	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-12	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

This report makes reference to the following documents:

D1: EP-A-0 352 675 (BASF AG) (1990-01-31)

D2: DATABASE XFIRE BEILSTEIN; (1998-06-27), Beilstein Reaction No. 2044673 & Schorigin *et alia*, Chem. Ber., 66 (1993), 389-393

D4: Courtot P. *et alia*, J. Chem. Res. Miniprint, 10 (1981), 3516-3528

D4: Climent *et alia*, Adv. Synth. Catal. (2002), 344 (10), 1090-1096

INDEPENDENT CLAIM 1

Novelty

The applicant has restricted the subject matter of claim 1 in such a way that the 2-arylacetaldehyde I and the non-enolisable aldehyde compound II are used in the process in a molar ratio of I:II ranging from 1:1.05 to 1:5.

As a result, the present application now meets the requirements of PCT Article 33(2).

D1 discloses the preparation of E-2-(4-fluorophenyl)-3-

(2-trifluoromethylphenyl)-propenal, starting from 2-trifluorobenzaldehyde and fluorophenyl acetaldehyde (example A, page 6). According to D1, 8.4 g sodium hydroxide (0.21 mole) in 40 ml water are added to a solution of 85.5 g **(0.5 mole)** 2-trifluoromethyl benzaldehyde in 300 ml methanol (V_{MeOH}:V_{water} = 7.5:1). The reaction mixture is cooled and 69 g **(0.5 mole)** 4-fluorophenyl acetaldehyde are added drop by drop. The molar ratio of 2-fluorophenyl acetaldehyde to trifluorobenzaldehyde amounts to 1:1.

D2 discloses the preparation of E-2,3-diphenyl-acrylaldehyde, starting from benzaldehyde and phenyl acetaldehyde in water or ethanol, in the presence of NaOH (pages 391-392). According to D2, 21 g benzaldehyde **(0.2 mole)** and 24 g phenyl acetaldehyde **(0.2 mole)**, 120 ml alcohol, 60 ccm water and 2 g NaOH (0.05 mole) are mixed. At the end of the process, 3g E-2,3-diphenyl-acrylaldehyde (0.01 mole) are produced, with a 5% yield. The molar ratio of phenyl acetaldehyde to benzaldehyde amounts to 1:1.

D3 discloses the preparation of E-phenyl-2-p-tolyl-3-propen-2-al, starting from phenyl acetaldehyde and p-tolualdehyde, in the presence of MeONa, in methanol as solvent, i.e. in a pure organic solvent.

D4 describes the condensation of benzaldehyde and heptanal in the presence of catalysts with bifunctional basic and acid properties. The subject matter of claim 1 is thus novel over D1-D4.

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Inventive step

The applicant addressed the problem (see page 2 of the description) of devising a process for preparing 2,3-cis-disubstituted 2-arylpropenals with high yield and high stereoselectivity.

The problem is solved by the application in that the reaction of arylpropenal with the non-enolisable aldehyde is carried out in a solvent mixture which includes at least one water-miscible organic solvent and water, and in that the non-enolisable aldehyde is used in excess in relation to the 2-arylacetaldehyde I, and hence in relation to the reaction stoichiometry.

Neither D1 nor D2 give a person skilled in the art any indication on how to improve yield and selectivity.

The use of the claimed solvent mixture and the excess of non-enolisable aldehyde compound II achieves high yields and high stereoselectivity with regard to the cis compound (more than 20:1) (see all the examples).

In the comparative example 14 (page 13), the applicant has further shown that this level of stereoselectivity is not obtained in a pure organic solvent (as in D3, for example) and with the use of an excess of non-enolisable aldehyde. Since D4 does not relate to the preparation of 2,3-cis-substituted aryl-propenals, D4 does not contain any indication on how to avoid the by-products produced during the preparation of 2,3-cis-substituted aryl-propenals.

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Consequently, the solution proposed in claim 1 involves an inventive step in relation to D1-D4 (PCT Article 33(3)).

DEPENDENT CLAIMS 2-12

Claims 2-12 are dependent on claim 1 and thus also meet the PCT novelty and inventive step requirements.